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NTC ORLANDO
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OPERABLE UNIT 2 (OU 2) PHASE II PILOT INJECTIONS OF ORGANIC SUBSTRATE WORK
PLAN REVISION 1 NTC ORLANDO FL
5/13/2008
AGVIQ-CH2MHILL



WORK PLAN REVISION

REVISION NO: 01

CONTRACT NO: N62467-03-D-0260

PROJECT NAME: <u>Former Naval Training Center (NTC) Orlando</u>	TO NO: <u>0002</u>
SITE/TASK: <u>Operable Unit 2 – Phase II Pilot Injections of Organic Substrate</u>	WORK PLAN DATE: <u>May 2007</u>
WORK PLAN NAME: <u>Pilot Study Work Plan Addendum, Biobarrier Injection of Emulsified Oil Substrate at Operable Unit 2, NTC Orlando</u>	DATE OF REVISION: <u>May 13, 2008</u>
REVISION PREPARED BY: <u>CH2MHILL Project Team</u>	

Modifications/Revisions:	
Item No.	Description of Modifications/Revisions
	<p>The purpose of this Work Plan Revision is to outline the procedures to be used in implementing Phase II Emulsified Oil Substrate (EOS®) injections at Operable Unit 2 (OU2). A preliminary Pilot Study was conducted during June to October 2007 utilizing the <i>Biobarrier Pilot Study Work Plan, OU2, NTC Orlando</i> (CH2M HILL, January 2006) and the <i>Pilot Study Work Plan Addendum, Biobarrier Injection of Emulsified Oil Substrate, Operable Unit 2, NTC Orlando</i> (AGVIQ-CH2M HILL JVII [JVII], May 2007). See Figure 1 for a site location map showing the EOS® biobarrier location. Based on the findings of the Pilot Study, JVII, with concurrence from the Department of the Navy, Naval Facilities Engineering Command, Southeast (NAVFAC SE), proposed Phase II Pilot injections. The overall approach for well installations and EOS® injections at OU2 will be consistent with procedures outlined in the approved Work Plan and Work Plan Addendum.</p> <ul style="list-style-type: none"> • This Work Plan Revision provides specific details for the scope of work tasks that are different from the previous Work Plan and Work Plan Addendum referenced above. CH2M HILL will use the procedures outlined in this Work Plan Revision in conjunction with the information in the existing approved Work Plan and Work Plan Addendum to complete the Phase II EOS® injections at OU2. These tasks are described below:
001	<ul style="list-style-type: none"> • Based on the findings from the Phase I Pilot Study conducted May to August 2007, a phased approach to the biobarrier injections was proposed. Accordingly, 11 pairs of injection wells (IW-12A/B through IW-22A/B) will be installed in two parallel rows as shown on Figures 2 and 3. Well construction details will be similar to the Pilot Study with the exception of the following changes: <ul style="list-style-type: none"> – At each injection location, a pair of injection wells will be installed, one in the shallower Zone A and one in the deeper Zone B. Both wells will be constructed with 2-inch inside diameter well risers and 10-foot long, Johnson® polyvinyl chloride (PVC), Vee-wire-wrapped screens. The deeper Zone B wells will be installed just above the Hawthorn confining clay unit. The approximate depth to the confining unit is 35 feet with localized variations in depth to be determined by CH2M HILL’s geologist. The estimated depth of the Zone B wells is expected to be 35 feet (with screen intervals from approximately 25 feet below land surface [bls] to 35 feet bls). The deeper Zone B wells will be installed first to determine the actual depth to the clay confining unit and to place the well screens just above the confining clay unit. The estimated depth of the Zone A wells is expected to be 25 feet (with screen intervals from approximately 15 to 25 feet bls). The screen depth for the shallower Zone A wells will be placed such that the bottom of the Zone A well screen interval terminates at the same elevation as the top of the adjacent Zone B well screen interval. This arrangement is designed to provide a continuous vertical target treatment interval with a total length of 20 feet at each injection location.

	<ul style="list-style-type: none"> - Based on observations made during the Phase I Pilot Study well development, the filter pack sand proposed to be used for the Phase II Pilot injections will be 6/20 mesh silica sand instead of the 20/30 mesh silica sand previously used. This revised specification ensures the same filtering performance suitable for a 0.020-inch wire-wrapped screen as the 20/30 filter pack, but with a reduced chance of intrusion of fines into the well screen. • The EOS® injectate is being increased to a 2 percent solution in water compared to the 1 percent solution in water used during the Phase I Pilot Study injections. This will provide a greater amount of substrate to enhance the biodegradation of the chlorinated volatile organic compound (CVOC) contamination present in the groundwater at this site. • Six pairs of groundwater monitoring wells (MW-49A/B through MW-54A/B) will be installed at locations shown on Figures 2 and 3. These monitoring wells will be installed with the same well construction specifications as the Phase I Pilot Study wells, with 2-inch inside diameter Schedule 40 PVC well risers and 0.010-inch factory-slotted well screens. Each pair of monitoring wells will be installed to the same depths as the nearest Zone A and Zone B injection well pairs. Additionally, the screen intervals of the Zone A/B pair of monitoring wells will match the screen intervals of the nearest Zone A/B pair of injection wells.
002	<ul style="list-style-type: none"> • Based on an assumed effective porosity of 0.25 in the site soils, a radius of influence of 10 feet around each injection well, and a well screen length of 10 feet, the total volume of 2 percent EOS® required to be injected into each injection well will be 13,000 gallons. The total quantity of EOS® concentrate required for each well will be 260 gallons (4.7 drums). • It is anticipated that the injection rate will be approximately 2 to 3 gallons per minute (gpm) at each location. • As documented in the <i>Biobarrier Pilot Study Work Plan (JVII, 2006)</i>, sodium hydroxide (NaOH) and sodium bromide tracer will be added to the injected solution using a metering pump and Dosatron®, respectively. Based on experience at other NTC Orlando sites, sodium hydroxide will be added at a concentration of 70 milligrams per liter. Approximately 20 pounds of sodium bromide will be added for every 13,000 gallons of 2 percent EOS® solution.
003	<p>Figures 1 through 3</p> <ul style="list-style-type: none"> • Figure 1 shows the site location. Figure 2 shows the layout of the full-scale biobarrier injection wells with a portion of the biobarrier that will be installed during this Phase II Pilot Study. Figure 3 shows the details of the well spacing, and injection and monitoring well identification and locations.
004	<p>Revised Table 2-1 for the Sampling and Analysis Plan</p> <ul style="list-style-type: none"> • The Sampling and Analysis Plan in the <i>Pilot Study Work Plan Addendum (JVII, May 2007)</i> referenced above will be followed to assess baseline and performance monitoring. The revised Table 2-1 identifies the new monitoring wells that will be sampled prior to the injections (baseline event) and twice after the injections (30 days and 60 days after injection). A site-wide treatment monitoring network will be proposed after the results of the Phase II Pilot Study are evaluated.
Reasons for the Modifications/Revisions:	
Item No.	Reasons for the Modifications/Revisions
001 - 004	The purpose of this revision is to present the details of additional injection and monitoring wells being installed as part of a Phase II Pilot Study. Additionally, the organic substrate will be injected at a higher concentration (2 percent) compared to the 1 percent in the Phase I Pilot Study conducted in May 2007.

Sumanth Naik
CTO Project Manager

Signature

05/16/2008
Date

Craig Miller
Program Manager

Signature

05/16/2008
Date

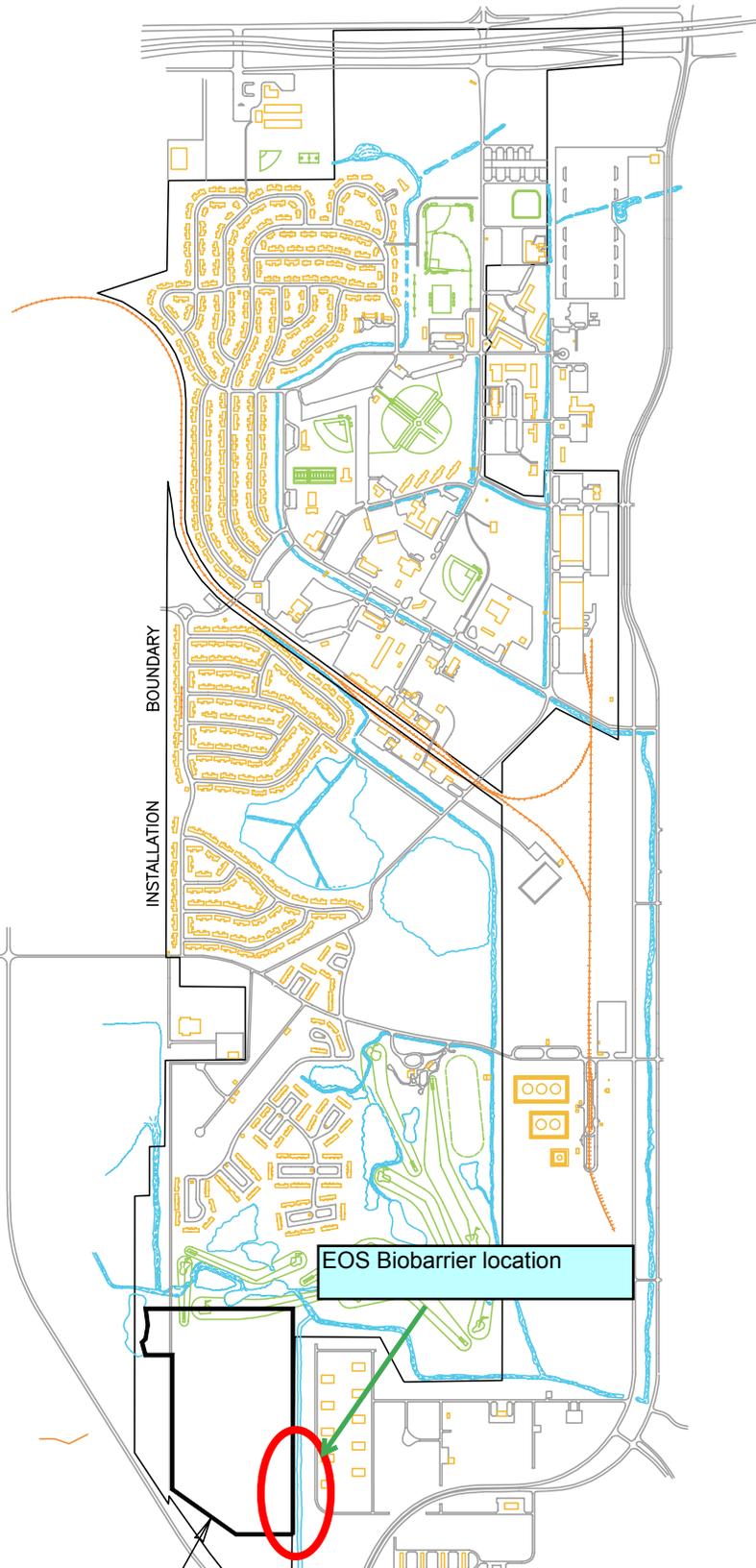
U.S. Navy Responsible Authority

Signature

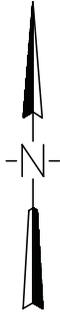
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Barbara Nwokike, BRAC PMO-SE	Mike Singletary/NAVFAC SE	David Grabka, FDEP
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McCOY
ANNEX



OU-02
LOCATION

EOS Biobarrier location

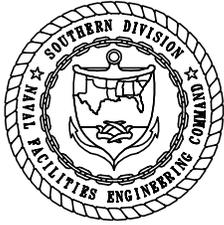


FIGURE 1
AREA LOCATION MAP
OPERABLE LIMIT - OU-02
McCOY ANNEX

NAVAL TRAINING CENTER
ORLANDO, FLORIDA

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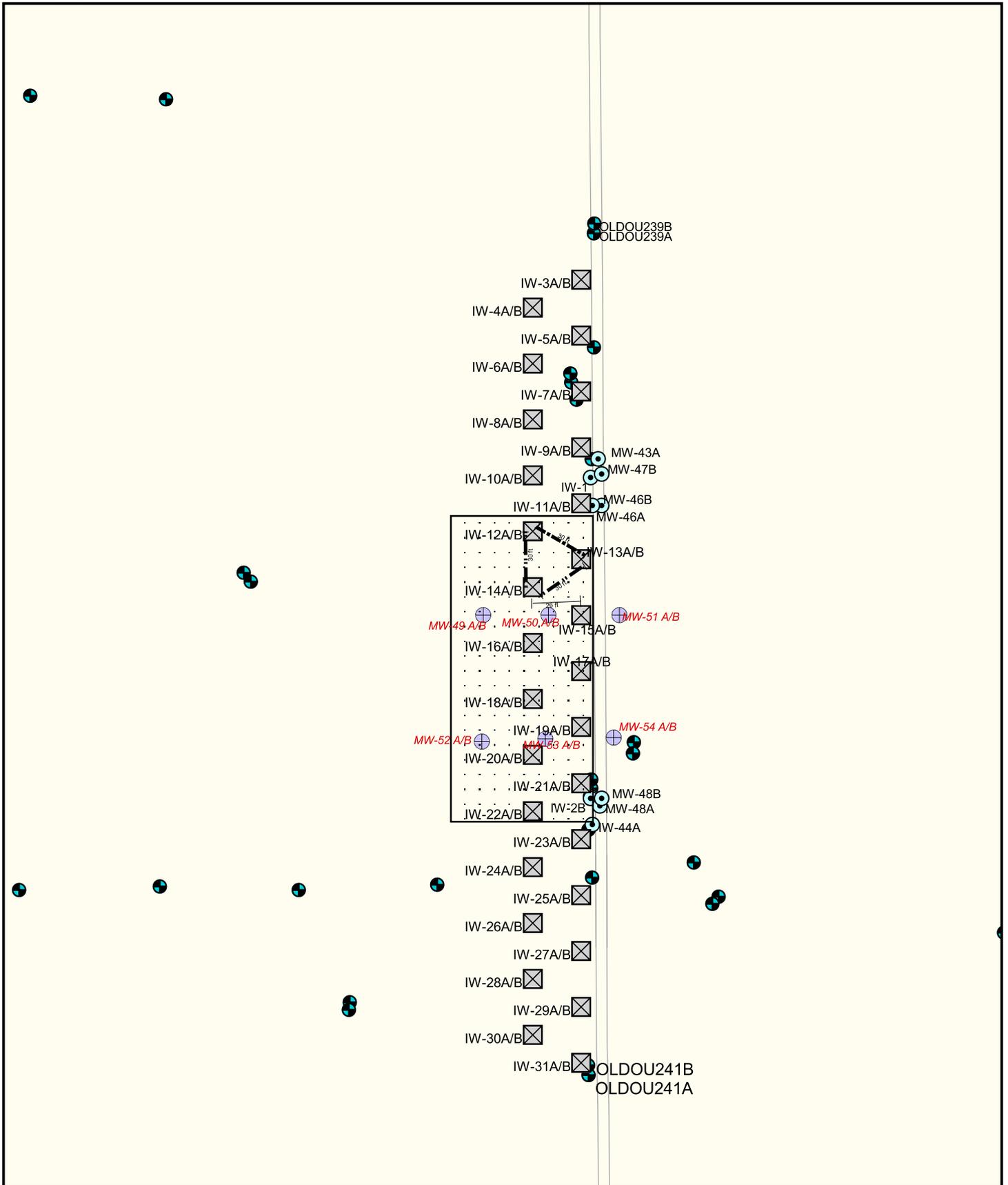
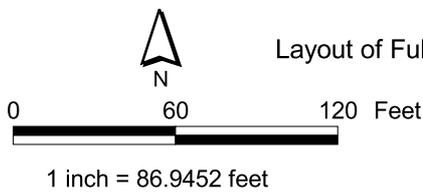
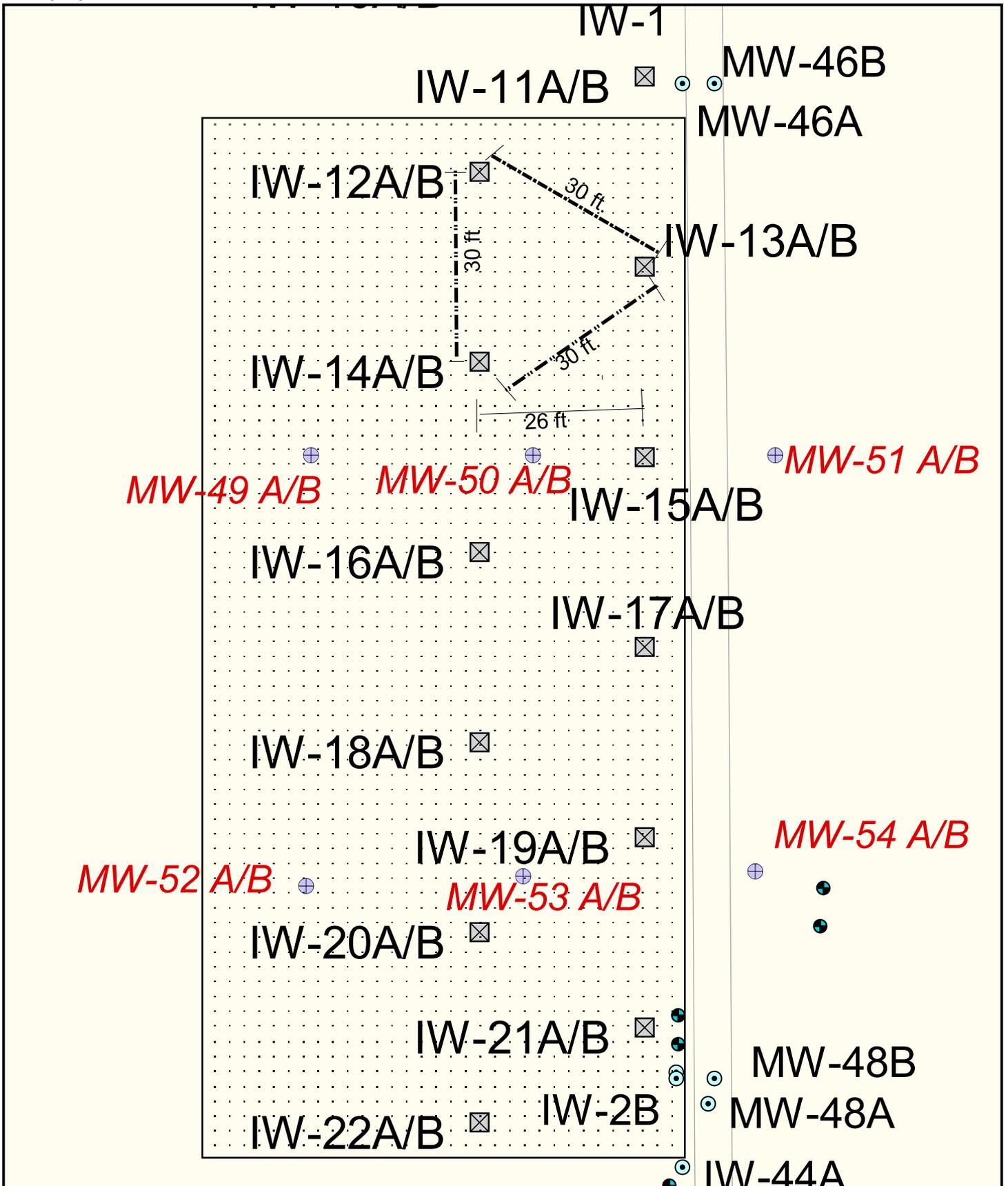


Figure 2
Layout of Full-Scale and Phase II Pilot Study Wells
OU2, NTC Orlando

- ☒ Injection wells
- Phase I Pilot wells
- ⊕ Phase II Pilot Monitoring Wells
- Historic Monitoring wells





- ☒ Full-scale biobarrier injection well.dbf
- ⊙ Ou2 phase i pilot wells.dbf



0 20 40 Feet

1 inch = 36 feet

Figure 3
Spacing of Injection Wells
Phase II Pilot Injections
OU2, NTC Orlando



Table 2-1a

Sampling and Analysis Summary Table

Phase II Pilot Injections for EOS Biobarrier Wall

Operable Unit 2, Former Naval Training Center (NTC), Orlando, Florida

Sample Task	Sample Point	Matrix	Sampling Frequency	Approx Sample No	Sampling Method (Note 1)	Sampling Equipment (Note 1)	TAT (Note 2)	Data Package Reqmnt	Required Analysis	Analytical Method	Holding Time	Sample Preservation	Containers
Groundwater Characterization Sampling													
Groundwater Treatment Performance Sampling	OLD-OU2-MW-49A OLD-OU2-MW-49B OLD-OU2-MW-50A OLD-OU2-MW-50B OLD-OU2-MW-51A OLD-OU2-MW-51B OLD-OU2-MW-52A OLD-OU2-MW-52B OLD-OU2-MW-53A OLD-OU2-MW-53B OLD-OU2-MW-54A OLD-OU2-MW-54B	Water	Baseline then 30 days and 60 days after baseline	12 + 2 Dup + 1MS/MSD = 16 per event	Grab	Peristaltic Pump; Teflon Tubing	14 days	CH2M HILL Level C	Volatiles	8260B	14 days	HCL pH <2; Cool to 4°C	(2) 40 mL vial
									Sodium	6010B	180 days	HNO ₃ pH< 2; Cool to 4°C	(1) 500mL HDPE
									Total Dissolved Solids	SM 2540C	7 days	Cool to 4° C	(1) 1000mL HDPE
									Total Suspended Solids	SM 2540D	7 days	Cool to 4° C	(1) 1000mL HDPE
									TRPH	FL-PRO	7 days ext; 40 days analysis	HCL or H ₂ SO ₄ pH <2; Cool to 4°C	(2) 1L amber glass
									Alkalinity	SM 2320B	14 days	Cool to 4°C	(1) 500 mL HDPE
									TOC	SM 5310B	28 days	HCL or H ₂ SO ₄ pH <2; Cool to 4°C	(2) 40 mL amber vials
									Polysorbate 80	SM 5540D	48 hours	Cool to 4°C	(4) 500 mL glass
				q-DNA	qPCR (Microbial Insights Lab Method)	N/A	N/A	N/A					
				Volatile Fatty Acids	VFA(Microbial Insights Lab Method)	N/A	N/A	N/A					
				Phospholipid Fatty Acids	PLFA(Microbial Insights Lab Method)	N/A	N/A	N/A					
					OLD-OU2-MW-49A OLD-OU2-MW-49B OLD-OU2-MW-50A OLD-OU2-MW-50B OLD-OU2-MW-51A OLD-OU2-MW-51B OLD-OU2-MW-52A OLD-OU2-MW-52B OLD-OU2-MW-53A OLD-OU2-MW-53B OLD-OU2-MW-54A OLD-OU2-MW-54B	Water	Baseline then 30 days and 60 days after baseline	1 per well per event	Grab after flow through cells show stable conditions	Peristaltic Pump; Teflon Tubing; Horiba U-10 Water Quality Checker; ORP meter (if not included on Horiba)	ASAP	Screening	Temperature, pH, Specific Conductance, Turbidity, ORP
Grab	Hach or CHEMet field kit	ASAP	Screening						DO	Chemetrics Field Kit K7501	N/A	N/A	N/A
								Bromide	Hach Ion Selective Electrode-Bromide Product # E41M001	Direct Read	N/A	N/A	

Notes:

1) In accordance with FDEP SOPs

2) TAT is in calendar days

Table 2-1a

Sampling and Analysis Summary Table

Phase II Pilot Injections for EOS Biobarrier Wall

Operable Unit 2, Former Naval Training Center (NTC), Orlando, Florida

Sample Task	Sample Point	Matrix	Sampling Frequency	Approx Sample No	Sampling Method (Note 1)	Sampling Equipment (Note 1)	TAT (Note 2)	Data Package Reqmnt	Required Analysis	Analytical Method	Holding Time	Sample Preservation	Containers
Aqueous Waste Characterization													
Disposal of Aqueous Waste	Portable Tank or Drums	Water	Once per storage tank or one per 10 drums	As necessary	Grab	Drum thief or dip jar	14 days	CCI Level B	TCL Volatiles	8260B	14 days	HCl pH< 2; Cool to 4°C	(2) 40 ml vial
									TCL Semi-volatiles	8270C	7 days ext; 40 days analysis	Cool to 4°C	(4) 1L amber glass
									TCL Pesticides	8081A	7 days ext; 40 days analysis	Cool to 4°C	
									Herbicides	8151A	7 days ext; 40 days analysis	Cool to 4°C	
									TAL Metals	6010B/7470A	6 months; 28 days for Hg	HNO ₃ pH< 2; Cool to 4°C	(1) 500mL HDPE
									Corrosivity	9040C	ASAP	Cool to 4°C	(1) 1L amber glass
									Ignitability	1010	ASAP	Cool to 4°C	(1) 1L amber glass
Soil Waste Characterization													
Soil Characterization Sampling	Drums	Soil	One per 10 drums	4	Composite grabs from 6 points into 1 sample (VOCs collected from a single grab)	Hand Auger, SS spoon, SS bowl	14 days	CH2M HILL Level B	TCLP Volatiles	1311/8260B	14 day TCLP extr; 14 day analysis	Cool to 4°C	(1) 4 oz glass
									TCLP Semi-Volatiles	1311/8270C	14 day TCLP extr; 7 day extr; 40 day analysis	Cool to 4°C	(3) 8 oz glass
									TCLP Metals	1311/6010B/7470A	6 month TCLP extr; 6 month analysis Hg: 28 day TCLP extr; 28 day analysis		
									TCLP Pesticides	1311/8081A	14 day TCLP extr; 7 day extr; 40 day analysis		
									TCLP Herbicides	1311/8151A	14 day TCLP extr; 7 day extr; 40 day analysis		
									Corrosivity	9045C	ASAP		
									Ignitability	1010/1030	ASAP		

Notes:

1) In accordance with FDEP SOPs

2) TAT is in calendar days